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Thin Film Optical Filters
Brochure from Corion Instrument Corp Waltham, Mass
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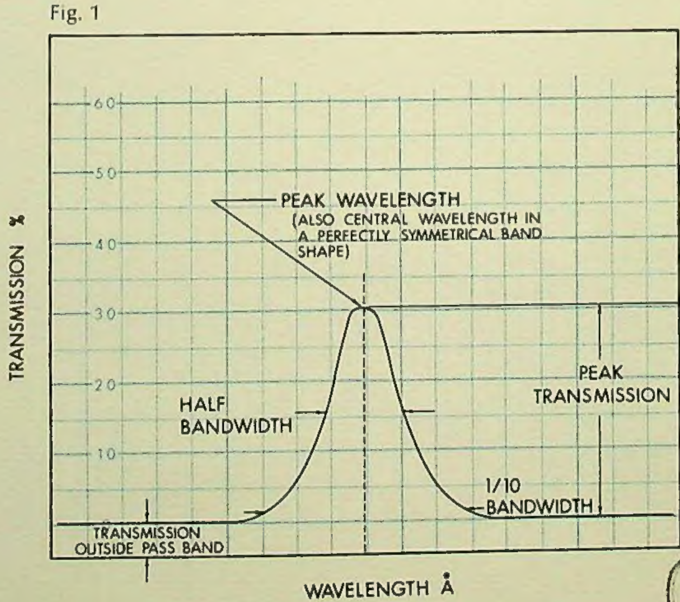
THIN FILM OPTICAL FILTERS

Peak Wavelength	The wavelength of maximum transmission.
Central Wavelength	The wavelength at the midpoint of the half width = λ_0 Note: In a perfectly symmetrical band shape, peak wavelength equals central wavelength.
Peak Transmission	Maximum percent transmission of the passband.
Tolerance	The accuracy of a filter measured at central wavelength.
Half Bandwidth	The width of a band measured at half peak transmission; also commonly called bandwidth.
% Bandwidth	The half width expressed as a percentile of central wavelength; i.e., 0.1% filter at 4400 angstroms has a half band width of 4.4 angstroms.
Blocking	The inability of a filter to transmit at wavelengths outside the bandpass region — usually expressed as a percentage.
Cutoff	The slope going from a maximum transmission to 0% transmission; the cutoff point is the wavelength where transmittance equals 5% of peak.
Cuton	The slope going from 0% transmission to a maximum transmission; the cuton point is the wavelength where transmission equals 5% of peak.
Rejection Ratio	The ratio of peak transmission to that outside the passband.
Slope	The rate of change increasing from cuton to 80% of peak transmission, or decreasing from 80% of peak transmission to cutoff. $\text{Slope }\% = 100\left(\frac{\lambda\, 80\%\text{ max.} - \lambda\, 5\%}{\lambda\, 5\%}\right)$
Optical Density	Logarithm of the ratio of the transmissions: i.e., initial intensity = 100.0%, output intensity = 1.0%, therefore, $\text{O.D.} = \log_{10}\frac{100}{1} = 2.0$
Spectral Flatness	The transmission variation over a spectral wavelength range expressed as a percentage.

Fig. 1



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INTERFERENCE FILTERS

From a simple beginning, interference filters have gained dramatic acceptance as a means of obtaining spectral isolation. Today, filters with bandwidths as low as 1.0 angstrom are possible; 5.0 Å bandwidths are common and 10.0–100.0 Å bandwidths are in everyday use. In comparison to monochromators, interference filters are: relatively inexpensive; extremely durable; feature low stray light (typically one part in 10,000); and have light through-puts up to 10,000 times greater than that of the best monochromator made today.

Multi-layer interference filters can be designed . . .

- To transmit one portion of the spectrum while reflecting or absorbing another
- To isolate atomic lines from multi-line sources
- To isolate laser lines from environmental stray light
- To isolate pass bands from continuous sources
- To handle other spectral isolations

In use, they find application as spectral discriminators in: Flame photometers, atomic absorption instruments, colorimeters, photometers, micro-densitometers, fluorimeters, chromatography column monitors, process control instruments, vision instruments, basic research systems, lasers, navigational systems etc. — anywhere a pre-determined portion of the spectrum must be isolated or defined.

Two general types of interference filters are in common use today, the relatively simple metal-dielectric-metal or Fabry-Perot type filter, and the more complex all dielectric filter. Corion manufactures filters of the latter type, exclusively.

In the metal-dielectric-metal filter, a dielec tric layer having a thickness equal to 1/2 th wavelength of the designed passband wave length is deposited between two layers of hig reflectivity, but partially transmissive silver. Th wavelengths transmitted will, therefore, b function of the di-electric spacer layer. A di advantage of this type of filter is that there ar often secondary transmissions at multiple wave lengths of the passband wavelength. In add tion, half bandwidths of less than 50 Å ar rarely possible; in the ultra-violet, the minimum bandwidth is approximately 100 Å.

The all-dielectric filter, on the other han may be composed of up to 60 layers of alte natingly low and high index of refraction d electric materials. Through a process of destru tive and constructive interference, this type filte has the ability of providing bandwidths as lo as 1–5 angstroms (also up to 1000 Å) from th ultra-violet (2500 Å) to the near infra-red. A *important advantage* of the all di-electric filte is found in the *absence* of secondary transmi sion wavelengths.

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